

Multifunctional Metal-Polymer Nanocomposites for Space Applications, Phase I

Completed Technology Project (2006 - 2006)



Project Introduction

NASA has identified a need for new high performance-to-weight materials capable of protecting critical components from the space environment, mitigating threat of uncontrolled electrostatic discharge, and reducing vulnerability to radiation or thermally induced damage. Recent advances in metallic nanoparticle-polymer composites have shown promise of meeting these multifunctional design goals, but their achievement has been hampered by non-uniform dispersion of nanoparticles within the polymeric matrix. To address these problems, International Scientific Technologies - Aerospace Systems Division will modify metal nanoparticle surfaces with organic ligands to fabricate reliable nanocomposites. The proposed material development is responsive to NASA Subtopic X2.03 by providing a means by which a wide-range of multifunctional nanostructured materials may be designed and fabricated. The Phase I Technical Objectives include fabrication of conductive nanocomposites incorporating metallic nanoparticles in polymeric materials, measurement of nanocomposite properties in simulated space environments, and optimization of proof-of-concept conductive multifunctional nanocomposites. In the Phase I program, metallic nanoparticles will be functionalized for incorporation into polymeric matrices for electrostatic control and prevention of atomic oxygen degradation. The project innovation is the development of ligand-modified nanoparticle additives to realize multifunctional nanocomposites for space applications. Successful completion of the Phase I program will result in multifunctional spacecraft materials that are inherently anti-static for electrostatic control, and self-healing following degradation in harsh space environments. During Phase II, prototype multifunctional nanocomposites will be evaluated for control of electrostatic charging, and resistance to atomic oxygen and/or radiation degradation in simulated space environments prior to commercialization in Phase III.



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Langley Research Center (LaRC)

Responsible Program:

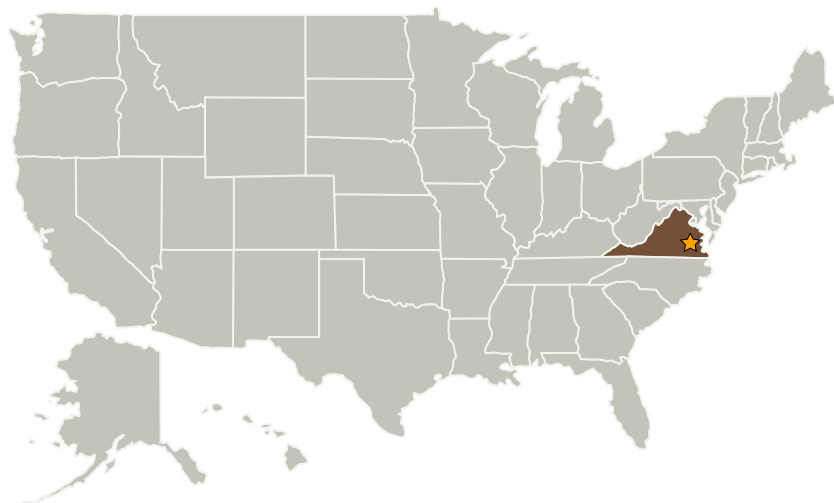
Small Business Innovation Research/Small Business Tech Transfer

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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Langley Research Center (LaRC)	Lead Organization	NASA Center	Hampton, Virginia
International Scientific Technologies, Inc.	Supporting Organization	Industry	Dublin, Virginia

Primary U.S. Work Locations

Virginia

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - └ TX12.1 Materials
 - └ TX12.1.7 Special Materials